



## STSJ80N4LLF3

N-channel 40V - 0.0042Ω - 18A - PowerSO-8™  
STripFET™III Power MOSFET for DC-DC conversion

### General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STSJ80N4LLF3	40V	0.005Ω	18A <sup>(1)</sup>

1. This value is rated according to R<sub>thj-pcb</sub>

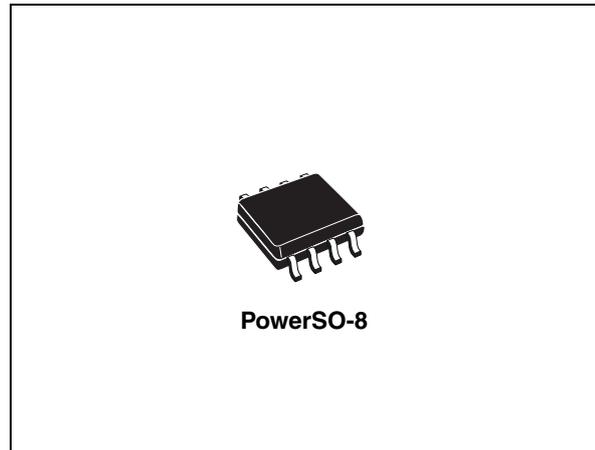
- Optimal R<sub>DS(on)</sub> x Q<sub>g</sub> trade-off @ 4.5V
- Switching losses reduced
- Low threshold device
- Improved junction-case thermal resistance

### Description

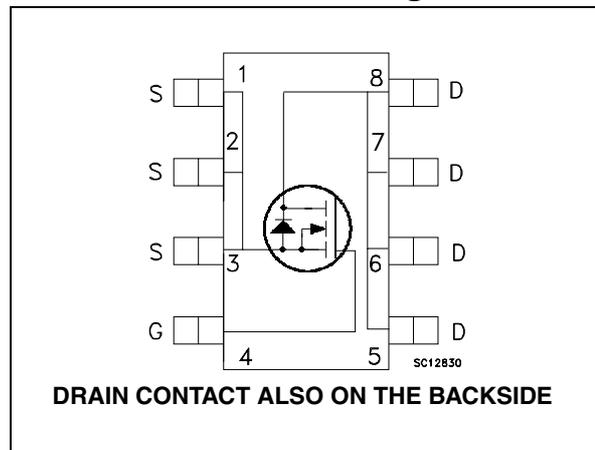
This series of product utilizes the latest advanced design rules of ST's proprietary STripFET™ technology. This process coupled to unique metallization techniques realizes the most advanced low voltage Power MOSFET in SO-8 ever produced. The exposed slug reduces the R<sub>thj-c</sub> improving the current capability.

### Applications

- Switching application



### Internal schematic diagram



### Order codes

Part number	Marking	Package	Packaging
STSJ80N4LLF3	80N4LL-	PowerSO-8	Tape & reel

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	40	V
$V_{GS}$	Gate- source voltage	$\pm 16$	V
$V_{GS}^{(1)}$	Gate- source voltage	$\pm 18$	V
$I_D^{(2)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	80	A
$I_D^{(3)}$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	18	A
$I_D^{(2)}$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	50	A
$I_{DM}^{(4)}$	Drain current (pulsed)	72	A
$P_{tot}^{(2)}$	Total dissipation at $T_C = 25^\circ\text{C}$	70	W
$P_{tot}^{(3)}$	Total dissipation at $T_C = 25^\circ\text{C}$	3	W
$T_j$ $T_{stg}$	Maximum operating junction temperature Storage temperature	-55 to 150	$^\circ\text{C}$

1. Guaranteed for test time  $\leq 15\text{ms}$
2. This value is rated according to  $R_{thj-c}$
3. This value is rated according to  $R_{thj-pcb}$
4. Pulse with limited by safe operating area

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-c}$	Thermal resistance junction-case max	1.8	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	42	$^\circ\text{C}/\text{W}$

1. When mounted on 1 inch<sup>2</sup> FR-4 board, 2oz Cu ( $t < 10\text{sec.}$ )

## 2 Electrical characteristics

( $T_{CASE}=25^{\circ}C$  unless otherwise specified)

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu A, V_{GS} = 0$	40			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = 40V, T_C = 25^{\circ}C$ $V_{DS} = 40V, T_C = 125^{\circ}C$			10 100	$\mu A$ $\mu A$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 16V$			$\pm 200$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1			V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 9A$ $V_{GS} = 4.5V, I_D = 9A$		0.0042 0.005	0.005 0.007	$\Omega$ $\Omega$

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25V, f = 1MHz,$ $V_{GS} = 0$		2530		pF
$C_{oss}$	Output capacitance			574		pF
$C_{rss}$	Reverse transfer capacitance			29		pF
$Q_g$	Total gate charge	$V_{DD} = 20V, I_D = 18A$ $V_{GS} = 4.5V$ <i>(see Figure 13)</i>		21.5	28	nC
$Q_{gs}$	Gate-source charge			6.9		nC
$Q_{gd}$	Gate-drain charge			8.2		nC
$R_G$	Gate input resistance	f=1 MHz Gate DC Bias = 0 Test signal level = 20mV open drain	1	3	5	$\Omega$

**Table 5. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 20V$ , $I_D = 9A$ $R_G = 4.7\Omega$ , $V_{GS} = 10V$ (see Figure 15)		17 25		ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD} = 20V$ , $I_D = 9A$ $R_G = 4.7\Omega$ , $V_{GS} = 10V$ (see Figure 15)		62 9		ns ns

**Table 6. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current				18	A
$I_{SDM}$	Source-drain current (pulsed)				72	A
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 18A$ , $V_{GS} = 0$			1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 18A$ , $di/dt = 100A/\mu s$		43		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 30V$ , $T_j = 150^\circ C$		64		nC
$I_{RRM}$	Reverse recovery current	(see Figure 14)		3		A

1. Pulsed: pulse duration = 300 $\mu s$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

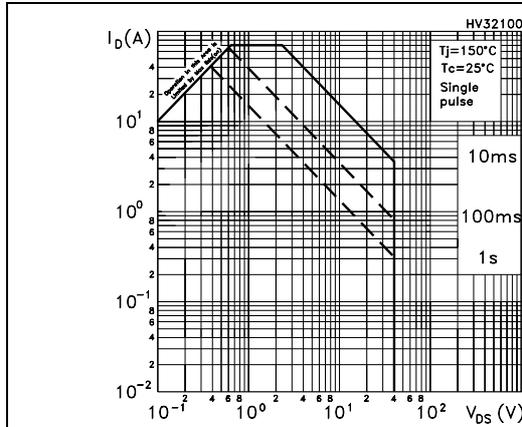


Figure 2. Thermal impedance

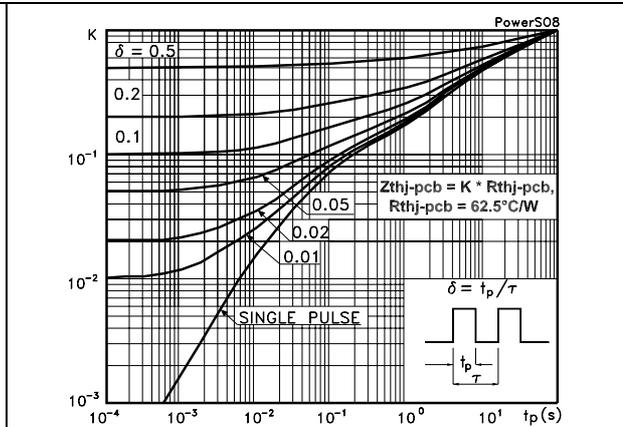


Figure 3. Output characteristics

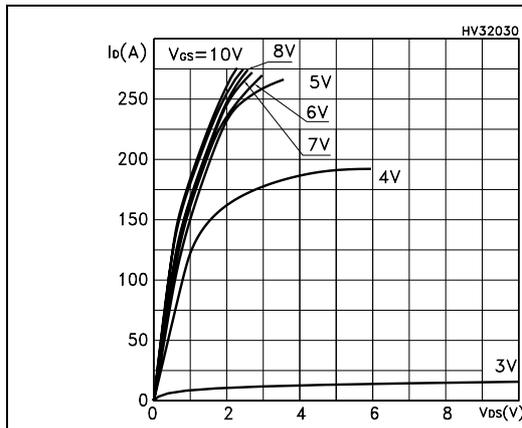


Figure 4. Transfer characteristics

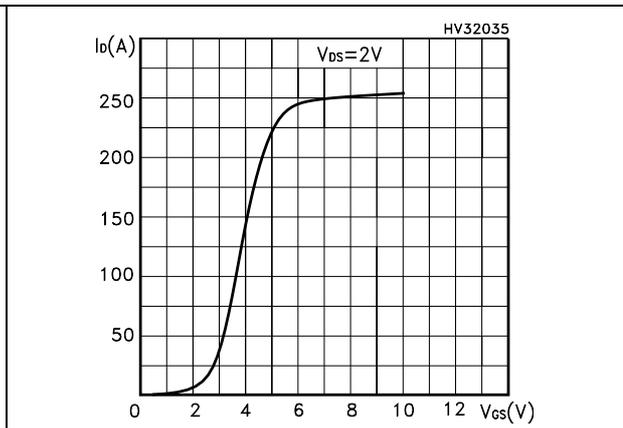


Figure 5. Normalized BV<sub>DSS</sub> vs temperature

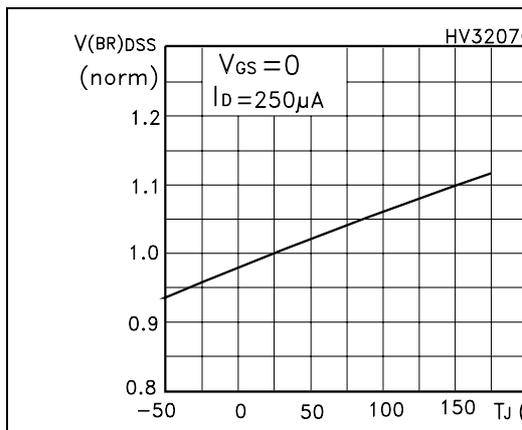


Figure 6. Static drain-source on resistance

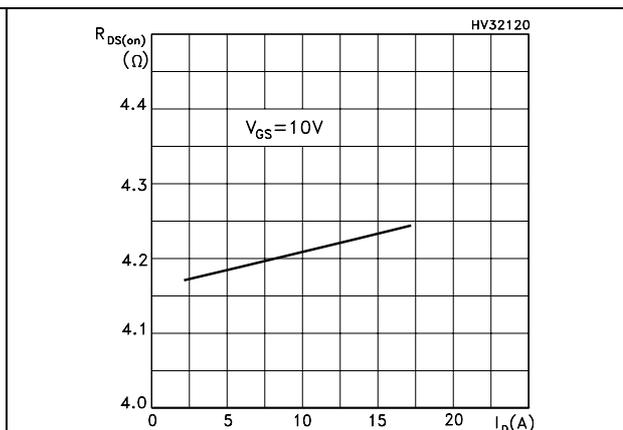


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

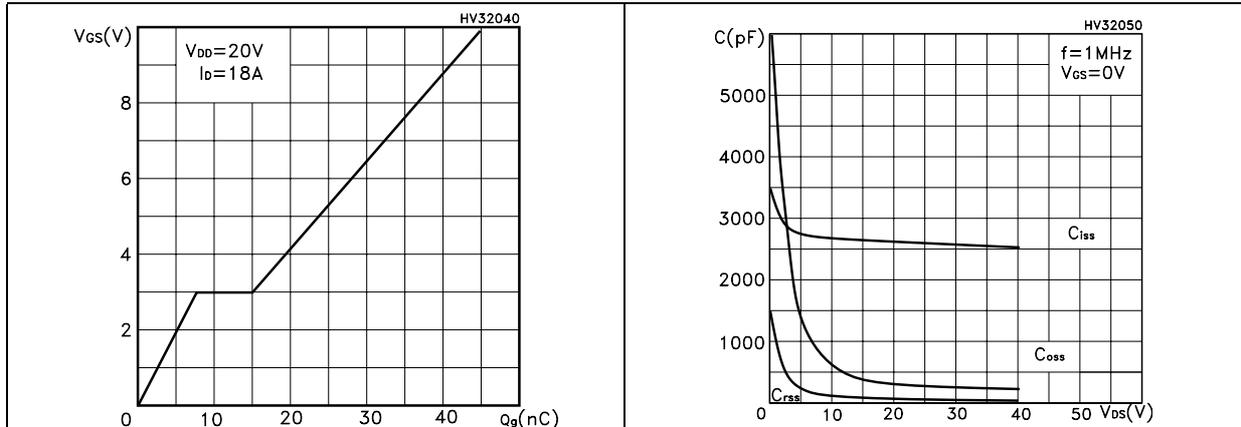


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

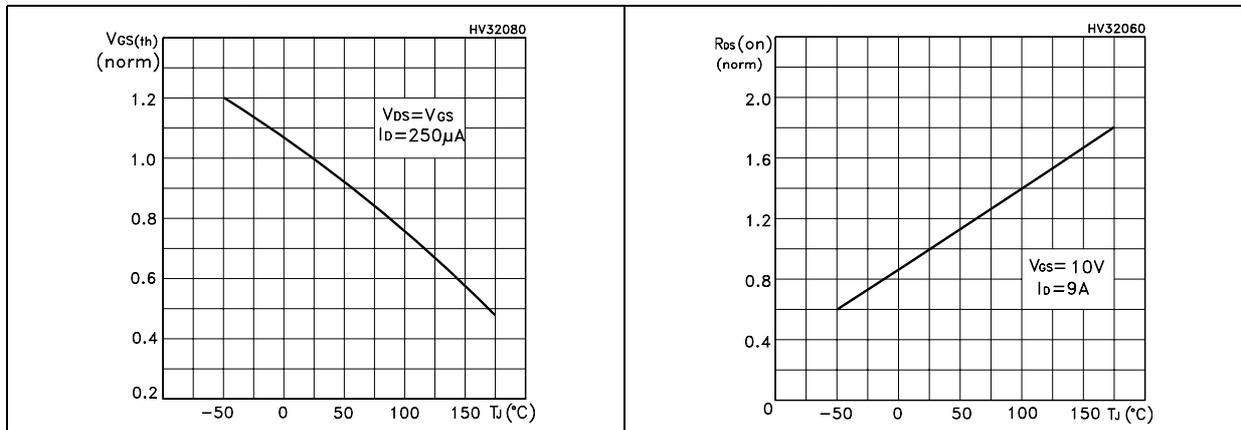
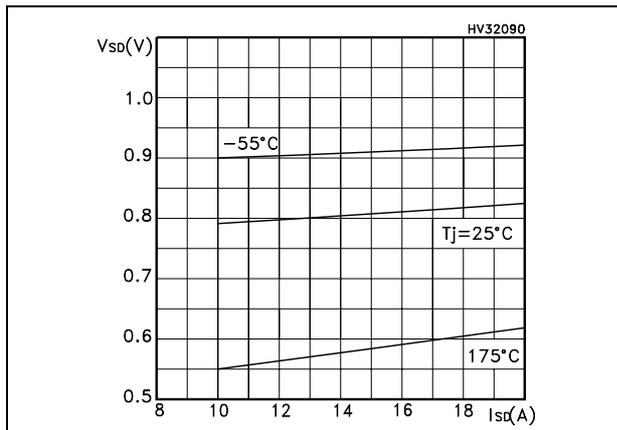


Figure 11. Source-drain diode forward characteristics



### 3 Test circuit

Figure 12. Switching times test circuit for resistive load

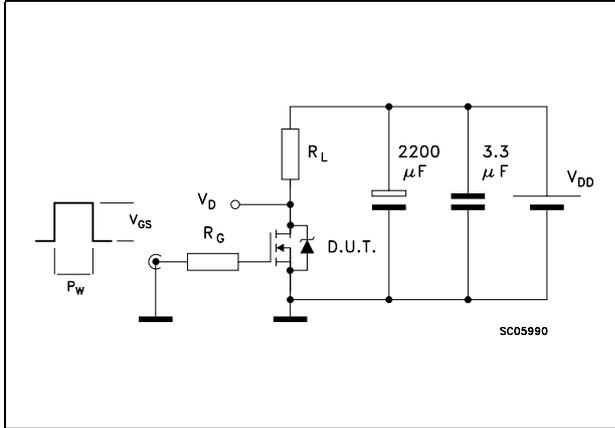


Figure 13. Gate charge test circuit

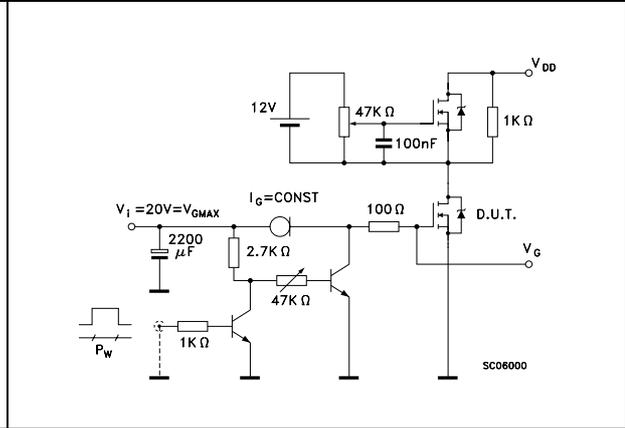


Figure 14. Test circuit for inductive load switching and diode recovery times

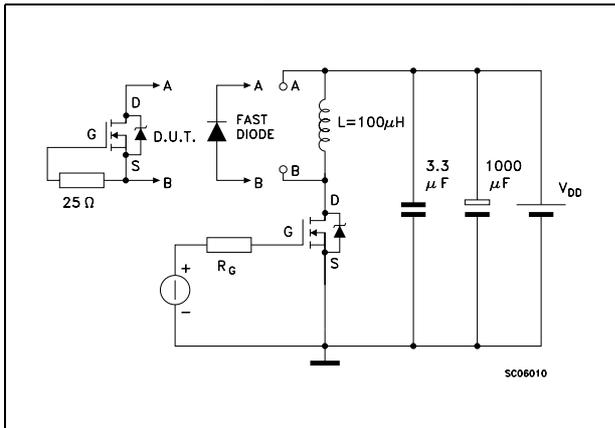


Figure 15. Unclamped inductive load test circuit

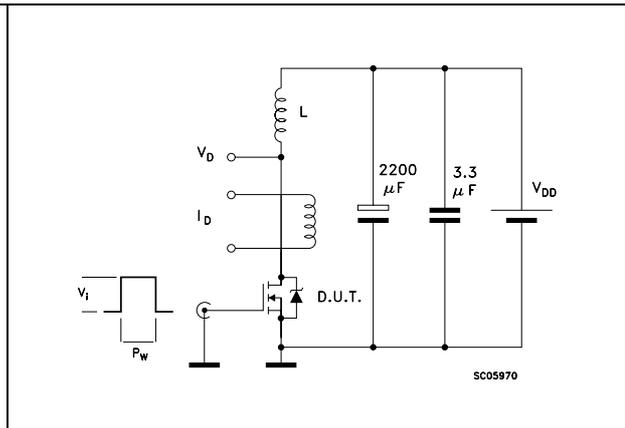


Figure 16. Unclamped inductive waveform

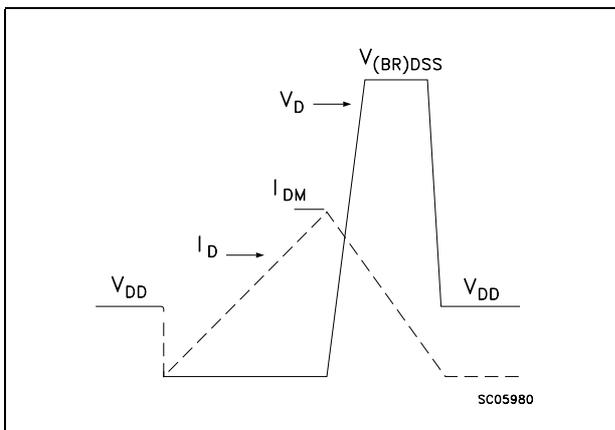
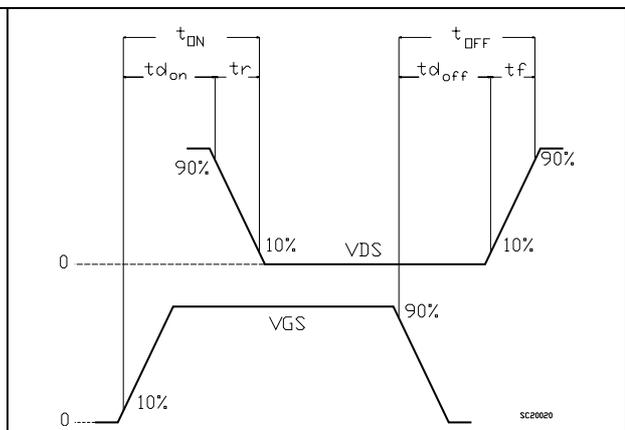


Figure 17. Switching time waveform

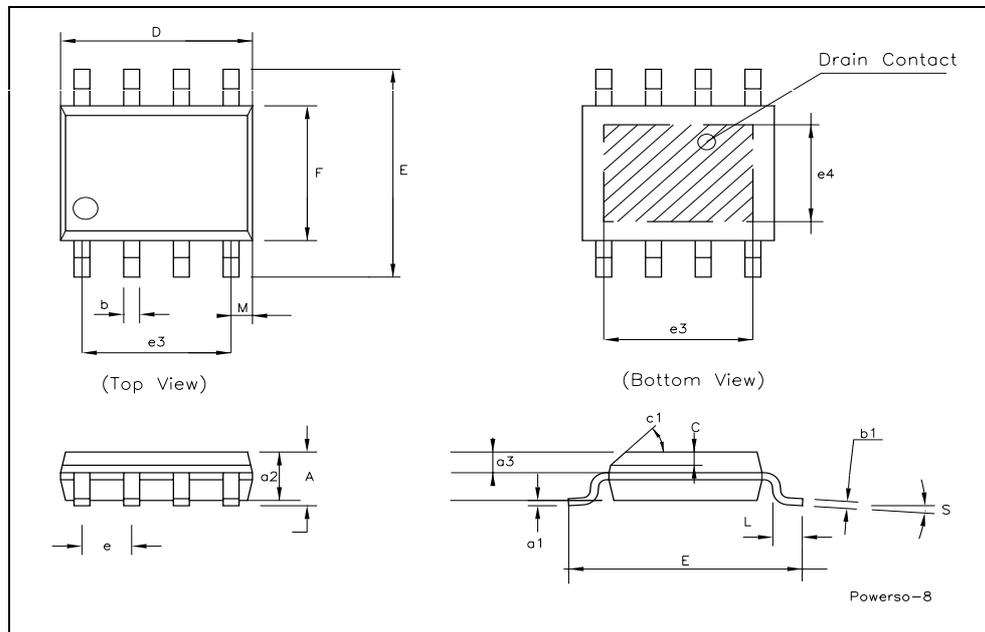


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

**PowerSO-8™ MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45° (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
e4		2.79			0.110	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8° (max.)					



## 5 Revision history

Table 7. Revision history

Date	Revision	Changes
13-May-2005	1	Initial release.
23-Jun-2006	2	New template, complete version
22-Nov-2006	3	Corrected part number

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